Check List 8(2): 215-217, 2012
© 2012 Check List and Authors
ISSN 1809-127X (available at *www.checklist.org.br*)

Check List
Journal of species lists and distribution

LISTS OF SPECIES

A contribution to the knowledge of the orchid bee fauna of the Los Amigos Biological Station, Madre de Dios, Peru (Hymenoptera: Apidae: Euglossini)

Reed S. Niemack, Daniel J. Bennett, Ismael Hinojosa-Diaz and Caroline S. Chaboo*

University of Kansas, Natural History Museum and Department of Ecology and Evolutionary Biology, Division of Entomology, 1501 Crestline Drive, Suite 140, University of Kansas, Lawrence, KS, U.S.A. 66049
* Corresponding author. E-mail: *cschaboo@ku.edu*

ABSTRACT: This study provides a list of orchid bees collected from the Los Amigos Biological Station, Madre de Dios, Peru. Specimens were captured by luring them to aromatic baits, eucalyptus oil and methyl salicylate, over a five day period in June, 2011. A total of 93 individuals in three genera and 15 species were collected at two approximate, yet ecologically distinctive, sites. Results are consistent with previous reports on the diversity of Amazonian orchid bees.

INTRODUCTION

Orchid bees, tribe Euglossini, are a conspicuous component of the Neotropical bee fauna, known for their striking metallic body coloration and for the remarkable behavior of the males, which collect aromatic compounds principally by visiting (and in turn pollinating) flowers of Orchidaceae (Dressler 1982). The compounds are manipulated and stored via a series of morphological modifications of the legs, and exposed during mating (Eltz *et al.* 2007). Once the diverse chemicals involved in the attraction of the euglossine males to orchid flowers were discovered (Dodson *et al.* 1969) they were used as bait to sample and collect orchid bees, which comprise five genera and a little over 200 species (Nemésio and Ramussen 2011). Orchid bees have been inventoried at several sites throughout the Amazon Basin (e.g., Morato 1994; Rasmussen 2009). Still, it is thought that only about 1/3 of the species have been described (Roubik and Hanson 2004). New species continue to be discovered (*e.g.*, Hinojosa-Díaz and Engel 2007; 2011a, b; Nemésio 2007; 2011a, b; Roubik 2004). Some species are also known pollinators of Brazil nuts (Myers *et al.* 2000; Mori and Prance 1987), and some authors suggest that they can be used as bio-indicators of habitat quality (Brown and Albrecht 2001; Hedström *et al.* 2006).

Herein, we present results of a survey of orchid bee diversity at the Los Amigos Biological Station, Madre de Dios, Peru. This is the first survey of the station and the second census after Dressler (1985) and Pearson and Dressler (1985) from this part of the Amazon basin.

MATERIALS AND METHODS

Study Area

Los Amigos Biological Station (LABS) is located 100 km west of Puerto Maldonado in Madre de Dios, Peru near the confluence of the Madre de Dios and Los Amigos rivers. It is administered by the U.S.-based Amazon Conservation Association (ACA) and its South American sister organization, Asociación para la Conservación de le Cuenca Amazónica (ACCA). The station occupies 453 hectares on a terrace between the two rivers and ranges in elevation from 225–296 meters above sea level. Habitats include a mix of primary tropical humid forests, mature secondary forests that were disturbed >50 years ago, bamboo and palm forests, swampy forests around oxbow lakes, and some maintained cut areas. Two areas about 600 m apart were chosen for surveys of orchid bees.

Site 1: "Forest" (12.55236° S; 70.10994° W). This site was located along a trail within a secondary, mature closed-canopy forest punctuated by occasional tree-falls, and containing a fairly sparse understory. Disturbance in this area was minimal though logging operations were occurring several km away.

Site 2: "Airfield" (12.55631° S; 70.10751° W). This disturbed area consisted of the north end of an abandoned airfield (~1000 x 50 m). It was fully open, devoid of large trees, and primarily occupied by shrubs, grasses, bamboo, and vines. This site was surrounded on all sides by mature forest equivalent to that of Site 1.

Specimen collection

Bees were netted on a daily basis over five days by RN using four chemical lures: methyl salicylate, eucalyptus oil, vanilla extract, and Listerine® mouthwash. These were individually applied to the tips of thick cotton cords and suspended from vegetation roughly two meters above the ground at stations every 10 m along a 100 m transect. Each station comprised of a single bait trap, and each bait trap was used at each site twice. Each site was baited in the following order: vanilla extract, Listerine®, control (no chemical bait), methyl salicylate, and eucalyptus oil. After applying baits to the cords, 15 minutes were allowed to pass before collections were made along each transect. Three to five minutes were spent at each station. Collections were carried out 10–14 June, 2011, and were frequently interrupted by rainfall. In total, 247 and 360

minutes of collecting time using chemical baits were spent in the airfield and forest sites, respectively. In a separate study by CSC and DJB, flight intercept traps (FIT) placed near the forest transect captured five bees during 7–13 of June, 2011; these specimen data are included because the FIT sampled the single specimen of *Eulaema* (*Apeulaema*) *cingulata* Fabricius.

Specimen Processing

Specimens were temporarily stored in glassine envelopes, and dried using silica gel. They were pinned, labeled, and databased at the Snow Entomological Museum Collection (SEMC) at the University of Kansas, Lawrence, Kansas, and were identified by IHD. Taxonomic names follow Nemésio and Rasmussen (2011). The study was conducted under Peru permit 056-2011-AG-DGFFS-DGEFFS to CSC and DJB and specimens are vouchered in the SEMC and in the collection of the Museum of Natural History, San Marcos University, Lima, Peru (MUSM).

Results and Discussion

Table 1 summarizes the orchid bees captured at the airfield and forest sites as well as their attraction to the methyl salicylate and eucalyptus oil baits. No bees were attracted to Listerine® or vanilla extract and will not be discussed further. In total, 93 individuals, three genera, and 15 species were captured. Over twice as many individuals and about 1.5 times more species were taken at the forest site than at the airfield site. A total of 88 individuals and 13 species were collected with the chemical baits; five additional individuals of four species (two additional) were collected with the flight intercept traps. About 1/3 of the total bees were caught between stations as a result of attraction to the insect net, which attained incidental residue of chemical lures from contact with the cotton cords and the bees. These bees are referred to in the table as hand collected, and should be regarded as being attracted to a mixture of methyl salicylate and eucalyptus oil.

A total of 67 individuals of 13 species in three genera were collected in the forest site with 62 being captured using chemical baits, and five with the use of a flight intercept trap (FIT). For the baits used, 16 individuals across seven species were collected with the methyl salicylate bait; 26 individuals across five species were collected with the eucalyptus oil bait; and 22 individuals across nine species were hand collected in Site 1. In the disturbed area (Site 2), a total of 26 individuals belonging to eight species and three genera were collected. Of the two baits which had any success, four individuals belonging to three species were collected using the eucalyptus oil bait; 14 individuals belonging to five species were collected using the methyl salicylate bait; and eight individuals belonging to five species were hand collected.

Dressler (1985) and Dressler and Pearson (1985) reported four genera and 39 species of orchid bees resulting from an intensive two-year survey of the orchid bees of the Tambopata Reserved Zone. This area is 90 km southwest of the LABS and shares similar habitats and climate. Though there are no previously published studies of the orchid bees of LABS, the two areas undoubtedly share a highly similar orchid bee fauna. In fact, all 15 species captured in this study were previously known from Tambopata.

Taxonomic issues

Euglossa occidentalis and *Eu. orellana* were described in the last decade (Roubik 2004), consequently both names are absent from the two 1985 studies. However, both species can be added to the Tambopata list, since Roubik described both from specimens identified as *Euglossa chalibeata* Friese, some of them part of the material collected for the Tambopata studies (Dressler 1985; Pearson and Dressler 1985).

Pooling results from both sites, and ignoring the hand collections, the lures attracted similar numbers of species (seven for eucalyptus oil, eight for methyl salicylate) and individuals (28 for eucalyptus oil, 30 for methyl salicylate).

Table 1. Abbreviations are as follows: EU = eucalyptus oil; MS = methyl salicylate; HC = hand collected; FIT = flight intercept trap

SPECIES	TOTAL	♂	♀	AIRFIELD: EU/MS/HC			FOREST: EU/MS/HC/FIT			
				EU	MS	HC	EU	MS	HC	FIT
Eufriesea pulchra Smith	2	2	0	0	1	0	0	0	1	0
Euglossa (*Euglossa*) *cognata* Dominique	4	4	0	0	1	1	0	2	0	0
Euglossa (*Euglossa*) *aff. despecta* Moure	1	1	0	0	1	0	0	0	0	0
Euglossa (*Glossura*) *ignita* Smith	17	17	0	1	0	1	7	4	3	1
Euglossa (*Glossura*) *imperialis* Cockerell	15	15	0	0	0	0	6	3	5	1
Euglossa (*Glossuropoda*) *intersecta* Latreille	5	5	0	0	0	0	3	1	1	0
Euglossa (*Euglossa*) *mixta* Friese	11	11	0	0	3	2	0	3	3	0
Euglossa (*Euglossa*) *modestior* Dressler	1	1	0	0	0	0	1	0	0	0
Euglossa (*Glossura*) *occidentalis* Roubik	5	5	0	1	0	0	0	1	3	0
Euglossa (*Glossura*) *orellana* Roubik	10	10	0	0	0	0	7	0	3	0
Euglossa (*Glossura*) spp.	2	0	2	0	0	0	0	0	0	2
Eulaema (*Apeulaema*) *cingulata* Fabricius	1	0	1	0	0	0	0	0	0	1
Eulaema (*Eulaema*) *bombiformis* Packard	1	1	0	0	0	0	0	0	1	0
Eulaema (*Eulaema*) *meriana* Olivier	3	3	0	2	0	1	0	0	0	0
Eulaema (*Apeulaema*) *mocsaryi* Friese	15	15	0	0	8	3	0	2	2	0
Total	**93**	**90**	**3**		**26**		**67 (62 excluding FIT)**			
Genera	**3**				**3**		**3**			
Species	**15**				**8**		**13 (11 excluding FIT)**			

However, the composition of species collected by each lure was distinctive, with no overlap in the airfield site and a 33% (three of nine species) overlap in the forest site. This demonstrates the utility of this combination of chemical baits; additional baits (e.g. eugenol, skatole, cineole, methyl cinnamate, benzyl acetate, etc.) would undoubtedly augment this list of species.

Nearly twice as many individuals and 1.5 times as many species were collected in the forest site than the airfield site, but this may reflect the greater collecting effort in the forest site. There may be differences in number of individuals and species composition between the two sites. Collecting with additional baits, for longer periods, and in more than one season might tease apart these variables, sample more species, discover new species, and further complement knowledge of the orchid bees of LABS.

Acknowledgments: Field study of RN was supported by KU funds, facilitated by these individuals: David Alexander (Entomology program), Leonard Krishtalka, Don Shobe, Jordan Yochim (BI); Kim Booth and Chris Haufler (EEB), and Kathleen Fawcett-McClawskey (Honors Program). A KU Environmental Studies Program Ruben Zadigan undergraduate scholarship to RN facilitated the preparation of the manuscript. The fieldwork of CSC and DJB was supported by NSF-EPSCoR grant 66928 (to CSC). We thank the Amazon Conservation Association and the staff of the Los Amigos Biological Station for hosting the study and Diana Silva and Luis Figueroa of the San Marcos University Museum of Natural History for logistical support. We particularly thank all the participants in the 2011 KU Field course. Two anonymous reviewers provided useful suggestions and we are grateful for their assistance.

Literature Cited

Brown, J.C. and C. Albrecht. 2001. The effect of tropical deforestation on stingless bees of the genus *Melipona* (Insecta: Hymenoptera: Apidae: Meliponini) in central Rondonia, Brazil. *Journal of Biogeography* 28(5): 623-634.

Dodson, C.H., R.L. Dressler, H.G. Hills, R.M. Adams and N.H. Williams. 1969. Biologically active compounds in orchid fragrances. *Science* 164: 1243-1249.

Dressler, R.L. 1982. Biology of the Orchid Bees (Euglossini). *Annual Review of Ecology and Systematics* 13: 373-394.

Eltz, T., A. Sager and K. Lanau. 2005. Juggling with volatiles: exposure of perfumes by displaying male orchid bees. *Journal of Comparative Physiology A: Neuroethology, Sensory, Neural, and Behavioral Physiology* 191: 575-581.

Hedström I., A. Denzel and G. Owens. 2006. Orchid bees as bio-indicators for organic coffee farms in Costa Rica: Does farm size affect their abundance? *Revista de Biología Tropical* 54(3): 965-969.

Hinojosa-Díaz, I.A. and M.S. Engel. 2007. Two new orchid bees of the subgenus *Euglossella* from Peru (Hymenoptera: Apidae). Beiträge zur Entomologie 57(1): 93-104.

Hinojosa-Díaz, I.A. and M.S. Engel. 2011a. Revision of the orchid bee subgenus *Euglossella* (Hymenoptera, Apidae), Part I, The *decorata* species group. ZooKeys 140: 27-69.

Hinojosa-Díaz, I.A. and M.S. Engel. 2011b. *Euglossa williamsi*, a new species of orchid bee from the Amazon Basin of Ecuador and Peru, with notes on its taxonomic association and biogeography (Hymenoptera, Apidae). ZooKeys 159: 49-63.

Morato, E.F. 1994. Abundância e riqueza de machos de Euglossini (Hymenoptera: Apidae) em áreas de terra firme e áreas de derrubada, nas vizinhanças de Manaus (Brasil). *Boletim do Museu Paraense Emilio Goeldi, Série Zoologia* 10(1): 95-105.

Mori, S.A. and G.T. Prance. 1987. Species diversity, phenology, plantanimal interactions, and their correlation with climate, as illustrated by the Brazil nut family (Lecythidaceae). *In* R.E. Dickenson (ed.), *The Geophysiology of Amazonia*. New Yrok: John Wiley and Sons.

Myers, G.P., A.C. Newton and O. Melgarejo. 2000. The influence of canopy gap size on natural regeneration of Brazil nut (*Bertholletia excelsa*) in Bolivia. *Forest Ecology and Management* 127: 119-128.

Nemésio, A. 2011a. *Euglossa marianae* sp. n. (Hymenoptera: Apidae): A new orchid bee from the Brazilian Atlantic Forest and the possible first documented local extinction of a forest-dependent orchid bee. *Zootaxa* 2892: 59-68.

Nemésio, A. 2011b. *Exaerete salsai* sp. n. (Hymenoptera: Apidae): a new orchid bee from eastern Brazil. *Zootaxa* 2976: 12-20.

Nemésio, A, and B. Bembé. 2008. A new species of *Eufriesea* from Bolivia, and rearrangement of the *Eufriesea auripes* species group. *Spixiana* 31: 241-246.

Nemésio, A. and C. Rasmussen. 2011. Nomenclatural issues in the orchid bees (Hymenoptera: Apidae: Euglossina) and an updated catalogue. *Zootaxa* 3006: 1-42.

Pearson, D.L. and R.L. Dressler. 1985. Two-year study of male orchid bee (Hymenoptera: Apidae: Euglossini) attraction to chemical baits in lowland south-eastern Peru. *Journal of Tropical Ecolology* 1: 37-54.

Rasmussen, C. 2009. Diversity and abundance of orchid bees (Hymenoptera: Apidae, Euglossini) in a tropical rainforest succession. *Neotropical Entomology* 38(1): 66-73.

Roubik, D. 2004. Sibling species of *Glossura* and *Glossuropoda* in the Amazon Region (Hymenoptera: Apidae: Euglossini). *Journal of the Kansas Entomological Society* 77(3): 235-253.

Roubik, P.E. and P.E. Hanson. 2004. Orchid Bee of Tropical America Biology and Field Guide. Santo Domingo de Heredia: *INBio*. 370 p.

Stork-Tonon, D., M.V. Silva and E.F. Morato. 2011. Checklist of Orchid Bees (Hymenoptera: Apidae) of "Lago do Silencio" Area, Boca do Acre, Amazonas, Brazil. *Check List* 7(5): 648-651.

Received: February 2012
Accepted: March 2012
Published online: May 2012
Editorial responsibility: Matthew Smart